Final Report
on State Energy Program (SEP) Special Project

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Remote Solar: Hilo Bayfront Lighting

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Disclaimer

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TABLE OF CONTENTS

PROJECT SCOPE

Seven photovoltaic powered lights were installed at the Hilo Bay Recreational Park. A portion of the installation is shown above.

This project involved the specification, procurement, installation, and operation of seven (7) photovoltaic (PV) powered area lights and support poles in the Hilo Bay Recreational Park, an off-grid location in Hawaii.

The Hilo Bay Recreational Park (HBRP) facility is managed by the County of Hawaii and is undergoing major improvements in its design and functionality.

The existing park covers over 1000’ of shoreline in front of downtown Hilo and is being renovated to include non-vehicular pathways, parking areas, restrooms and facilities for canoe racing.

Lighting was an important need identified for the recreational area.

GOALS AND OBJECTIVES OF PROJECT

The immediate objective of the project was to use PV-powered lights for the Hilo Bay Recreational Park to avoid the cost of providing underground connection to the nearest electrical distribution line.

Another objective of the project is to increase public awareness regarding a reliable application of PV technology.

The longer-term objective is to avoid diesel-fired electricity generation when solar energy can more suitably and cost-effectively meet the same needs.

BACKGROUND: PLANNED ELECTRICAL GENERATION ON THE ISLAND OF HAWAII

Although the island of Hawaii obtains some of its electricity from non-fossil fuel sources (wind, hydroelectric, geothermal, solar, and biomass), the utility's plan for future electrical generating capacity calls for diesel-fired generating units. Therefore, any new electrical demand which is met by off-grid renewable sources of energy will directly offset the need for construction of more diesel-fired units.

PROJECT PARTICIPANTS

The County of Hawaii, Hawaii Electric Light Company (HELCO), and the State of Hawaii were active participants in the project.

RESULTS

The following tasks were accomplished under the project:

1. Lighting needs and funding sources were identified. Whereas the origin of the idea for the project was the electric utility, which proposed to own the units and sell the lighting service to the County in accordance with their standard streetlight service, the County eventually decided to make the investment directly using the project funds and to design, install, and maintain the units.
2. Specifications were developed, bids solicited, and contract executed.
3. Lights were installed and tested.
4. Publicity on the project highlighted the solar lights as well as a solar kiosk in the area (developed as part of a different project).
5. A project evaluation was completed.

The photo above shows one of the PV-powered lights installed at the Hilo Bay Recreational Park.

In addition, the following goals were supported:

1. The project demonstrates a viable application of solar lighting for illuminating walkways, bikeways, parking lots, and various recreational and marine activities.

2. The project involved State and local government. Both the County of Hawaii and the State of Hawaii were active participants in the project.

3. Results are being disseminated locally as well as nationally. Under a separate effort, an educational exhibit that combines the use of photovoltaic (PV) technology with a Hawaiian theme was built. The "Solar Exhibit," shown below, is in the same area as the photovoltaic-powered lighting system and includes information about solar energy.

   The island of Hawaii is home to several nationally- and internationally-televised sporting events, including the Ironman Triathlon, fishing tournaments, golfing events, music and dance festivals, and the like. In addition to the local audience, the Hilo Bayfront area attracts tourists and, through the lights and kiosk, provides a PV educational opportunity.

   In addition, information on the lighting system and other applications of PV will be made available through the Internet.

The Solar Exhibit, also at Hilo Bay, provides information on solar energy to local, statewide and national audiences.

4. The project is expected to advance consumer acceptance through providing a cost-effective example of application of photovoltaic technology.

   This project provides an excellent opportunity to expand public awareness of the needs which may be met by solar. The renovated HBRP will attract not only local residents, but also many tourists as they explore historic downtown Hilo. The highly visible site is currently used as a practice area for local canoe paddling clubs and hosts paddling competitions for clubs from around the State. The use of PV lighting will serve to demonstrate the reliability of the product while expanding the usage times for the park. Area lighting will serve to increase safety and security in HBRP, a function which will be appreciated by those who wish to make use of the park facility.

5. The project is cost-effective, both on the basis of first cost and on operating costs. In determining that PV was the most economical option for this location, HELCO performed an estimate for the provision of standard utility service. Given the aesthetic requirements of using underground service for this project and the long distances for line extension to serve the unelectrified area, a cost estimate of $263,634.00 was developed by HELCO to provide electrical service for the lights. The cost did not include any poles, fixtures, transformers, light installation, or electricity charges. The electricity rate for streetlight service in the area was approximately 25 cents per kWh in 2000.

   In contrast, the costs for the provision of the photovoltaic-powered lighting, including the cost of design, equipment, installation, and energy, was $101,207.00.

The picture above shows the location of the Solar Exhibit (on the right) with respect to the PV lights. The exhibit is along the path lit by the lights. One of the PV lights is visible at the left of the picture; another is beyond the picture to the right.

6. The project directly avoids the use of fossil fuels at this location, and serves as an example to encourage non-fossil energy sources at other locations as well.

   Three of the lights have 150 Watt arrays and four of the lights have 250 Watt arrays, for a total PV capacity of 1450 Watts. Using a capacity factor of 22% for photovoltaics in this area (in other words, the output over a year will be the number of hours in the year times the PV arrays' capacity times the capacity factor), the energy into the lighting system is about 2,794 kWh per year.

   To determine savings in terms of Btu, 2794 times approximately 10,000 gross Btu per kWh (HECO average) = approximately 28 million Btu per year. If the photovoltaic arrays and poles are assumed to have a life of about 20 years, the potential avoidance of fossil fuel use by the systems is 28 million Btu times 20 years, or about 560 million Btu

for this installation. As a demonstration project, however, it also has value in encouraging similar installations elsewhere (and, thus, additional fossil fuel displacement).

SUMMARY

The completed project is an excellent application of renewable energy for an off-grid application, and will serve as an outstanding example of a cost-effective application of renewables. The project is also highly visible and educational.